

DATE: 25 March 2009

I.T.L. (PRODUCT TESTING) LTD.

FCC Radio Test Report

for


Securant Inc

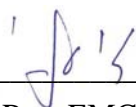
Equipment under test:

Wireless RFID Reader

SecurNozzle

Written by: 
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Approved by: 
I. Raz, EMC Laboratory Manager

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This report relates only to items tested.

Measurement/Technical Report for Securant Inc

Wireless RFID Reader

SecurNozzle

FCC ID: W69SNSIV10

This report concerns: Original Grant: X
Class I Change:
Class II Change:

Equipment type:

Limits used:
47CFR15 Section 15.247

Measurement procedure used is ANSI C63.4-2003.

Application for Certification
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1. General Information

1.1 Administrative Information

Manufacturer:	Securant Inc
Manufacturer's Address:	2110 Drew St. Clearwater Florida, 33765 U.S.A. Tel: +727-461-9799
Manufacturer's Representative:	Gaby Levy
Equipment Under Test (E.U.T):	Wireless RFID Reader
Equipment Model No.:	SecurNozzle
Equipment Serial No.:	Not Designated
Date of Receipt of E.U.T:	14.07.08
Start of Test:	14.07.08
End of Test:	10.11.08*
Test Laboratory Location:	I.T.L (Product Testing) Ltd. Kfar Bin Nun, ISRAEL 99780
Test Specifications:	FCC Part 15 Sub-part C

* Note: Radiated emission testing at 2390 MHz was performed on 23 March 2009. All test equipment was calibrated according their respective calibration due dates before testing.

1.2 List of Accreditations

The EMC laboratory of I.T.L. is accredited by the following bodies:

1. The American Association for Laboratory Accreditation (A2LA) (U.S.A.), Certificate No. 1152.01.
2. The Federal Communications Commission (FCC) (U.S.A.), Registration No. 90715.
3. The Israel Ministry of the Environment (Israel), Registration No. 1104/01.
4. The Voluntary Control Council for Interference by Information Technology Equipment (VCCI) (Japan), Registration Numbers: C-1350, R-1285.
5. Industry Canada (Canada), File No. IC 4025.
6. TUV Product Services, England, ASLLAS No. 97201.
7. Nemko (Norway), Authorization No. ELA 207.

I.T.L. Product Testing Ltd. is accredited by the American Association for Laboratory Accreditation (A2LA) and the results shown in this test report have been determined in accordance with I.T.L.'s terms of accreditation unless stated otherwise in the report.

1.3 **Product Description**

The SecurNozzle is part of the wireless control mechanism of FuelSafe, Securant's fuel control system.

The SecurNozzle is installed on the fueling nozzle. It is a battery-operated device that reads the information from a 115 kHz RFID tag installed on the fuel inlet of the vehicle and transmits this vehicle identification information using 2.4GHz ZigBee 802.15.4 communication to the Secur-e-Pump – the main device of the Fuel Control System.

SecurNozzle Key Features

Accelerometer

The SecurNozzle accelerometer is a two-axis +/- 2g/6g linear accelerometer directly interfaced to the SecurNozzle main controller. The SecurNozzle accelerometer is a motion sensor used to activate the system from its power-saving sleep mode.

RF-ID Reader

The SecurNozzle RF-ID reader is a standard 115 kHz reader and communication range of 10cm which uses "Half duplex – full hand shake" transaction protocol. When activated, the RF-ID reader searches for a Transponder (RF-ID passive tag).

ZigBee Radio

The SecurNozzle wireless communication ZigBee transmitter is based on the Ember EM250 chipset, a true single-chip 2.4 GHz IEEE 802.15.4 compliant RF transceiver with MAC support. The Zigbee transmitter is designed for low-power, low-voltage wireless applications.

The ZigBee transmitter was developed for use in fuel station wireless network communication and data transfer.

System Regular Functionality

The FuelSafe system authorizes fueling transactions after reading a vehicle's ID, transmitting the ID data to the pump, communicating through a SecurPC to Securant's system and receiving authorization for the initiation of a fueling transaction.

1.4 Test Methodology

Both conducted and radiated testing were performed according to the procedures in ANSI C63.4: 2003. Radiated testing was performed at an antenna to EUT distance of 3 meters.

1.5 Test Facility

The radiated emissions tests were performed at I.T.L.'s testing facility at Kfar Bin-Nun, Israel. This site is a FCC listed test laboratory (FCC Registration No. 90715, date of listing August 22, 2006).

I.T.L.'s EMC Laboratory is also accredited by A2LA, certificate No. 1152.01.

1.6 Measurement Uncertainty

Radiated Emission

The Open Site complies with the ± 4 dB Normalized Site Attenuation requirements of ANSI C63.4-2003. In accordance with Paragraph 5.4.6.1 of this standard, this tolerance includes instrumentation calibration errors, measurement technique errors, and errors due to site anomalies.

2. System Test Configuration

2.1 *Justification*

Radiated emission screening was performed in 3 orthogonal orientations. The worst case orientation was the “side” position.

The E.U.T. was operated simulating normal operation except that the transmission time was longer in order to enable measurements.

2.2 *EUT Exercise Software*

SecurNozzle software was run.

2.3 *Special Accessories*

No special accessories were required.

2.4 *Equipment Modifications*

Output power was reduced to the measured level using software

2.5 *Configuration of Tested System*

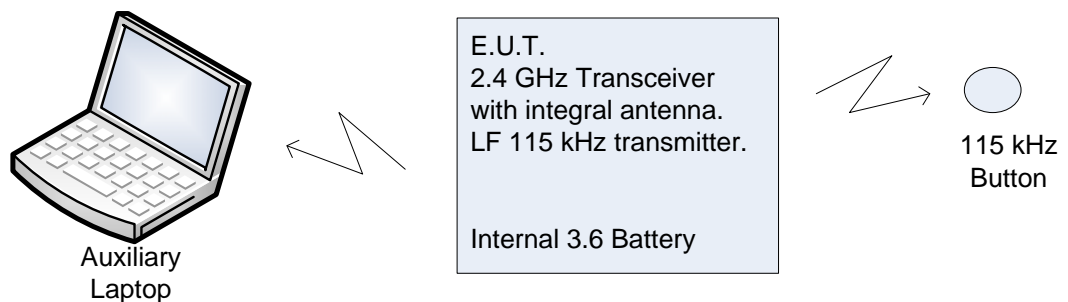


Figure 1. Configuration of Tested System

3. 6dB Minimum Bandwidth

3.1 Test Specification

F.C.C. Part 15, Subpart C: 15.247(a)(2)

3.2 Test procedure

The E.U.T was placed on a non-metallic table, 0.8 meters above the ground plane, on a remote-controlled turntable in the OATS. The test distance was 3 meters. The transmitter unit operated with normal modulation. The EMI receiver was set to 100 kHz resolution BW. The spectrum bandwidth of the transmitter unit was measured and recorded. The test was performed to measure the transmitter occupied bandwidth. The EUT was set up as shown in Figure 1, and its proper operation was checked. The transmitter occupied bandwidth was measured with the EMI receiver as frequency delta between reference points on modulation envelope. The E.U.T. was tested at 2405, 2440 and 2480 MHz.

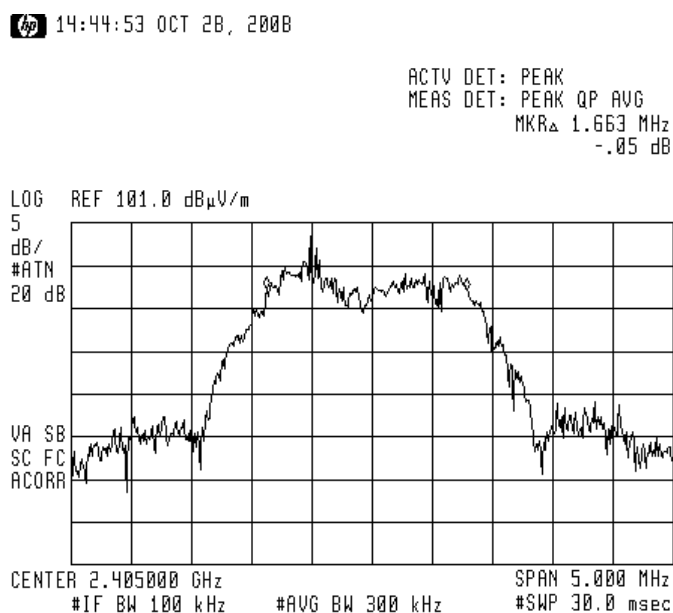


Figure 2. 2405 MHz

15:34:17 OCT 28, 2008

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR Δ 1.100 MHz
-15 dB

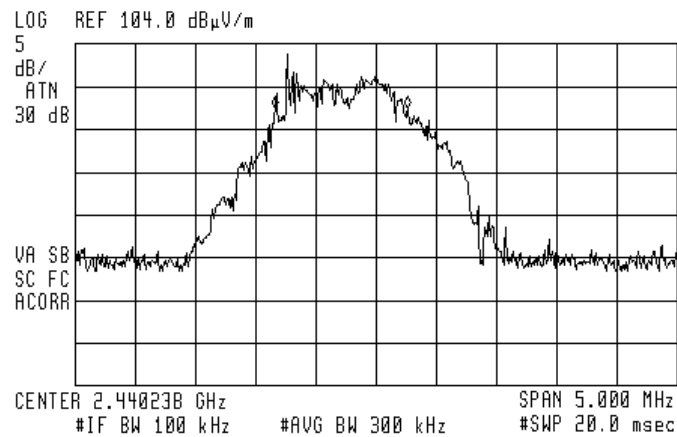


Figure 3. 2440 MHz

14:28:19 OCT 30, 2008

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR Δ 1.063 MHz
.05 dB

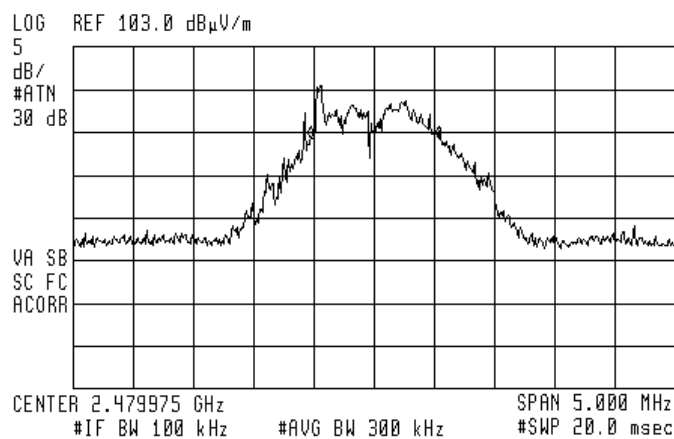


Figure 4. 2480 MHz

3.3 Test Results

E.U.T Description: Wireless RFID Reader

Model: SecurNozzle

Serial Number: Not Designated

Operation Frequency (MHz)	Bandwidth Reading (MHz)	Specification (MHz)
2405	1.663	>0.5
2440	1.100	>0.5
2480	1.063	>0.5

Figure 5 Test Results

JUDGEMENT: Passed

TEST PERSONNEL:

Tester Signature: 

Date: 25.01.09

Typed/Printed Name: A. Sharabi

3.4 Test Equipment Used.

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	HP	85422E	3906A00276	November 12, 2007	1 year
RF Section	HP	85420E	3705A00248	November 12, 2007	1 year
Antenna Log Periodic	A.H. Systems	SAS-200/511	253	February 4, 2007	2 years
Antenna Mast	ARA	AAM-4A	1001	N/A	N/A
Turntable	ARA	ART-1001/4	1001	N/A	N/A
Mast & Table Controller	ARA	ACU-2/5	1001	N/A	N/A
Printer	HP	LaserJet 2200	JPKGC19982	N/A	N/A

Figure 6 Test Equipment Used

4. Radiated Power Output

4.1 Test Specification

F.C.C. Part 15, Subpart C: 15.247(b)

4.2 Test procedure

The E.U.T was placed on a non-metallic table, 0.8 meters above the ground plane, on a remote-controlled turntable in the OATS. The test distance was 3 meters.

The transmitter unit operated with normal modulation. The EMI receiver was set to 1 MHz resolution BW. The EUT was set up as shown in Figure 3, and its proper operation was checked.

The readings were maximized by adjusting the antenna height between 1-4 meters, the turntable azimuth between 0-360°, and the antenna polarization.

The E.U.T. was tested in three operating channels and frequencies (1 (2.405 GHz); 8 (2.440 GHz); 14 (2.480 GHz)).

Radiated output power levels were measured at selected operation frequencies and the results were converted to power level according to the formula as shown below:

$$P = \frac{(E_{V/m} \times d)^2}{(30 \times G)} [W]$$

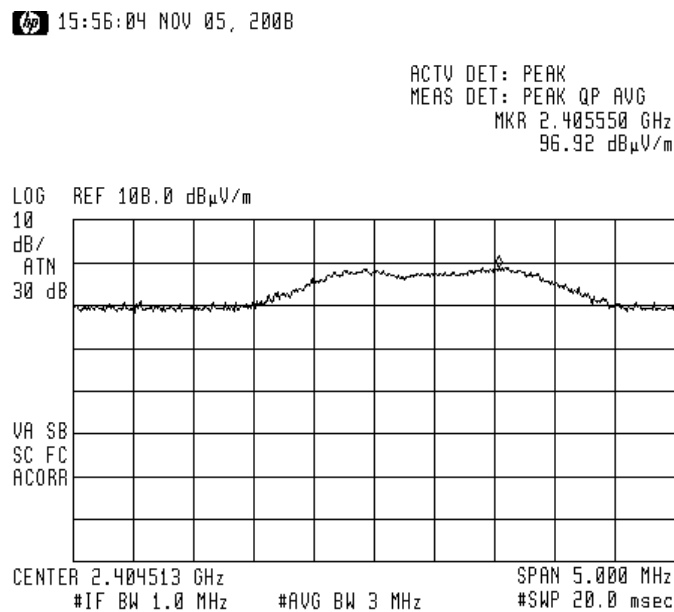


Figure 7 2405 MHz

15:22:13 NOV 05, 2008

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 2.440488 GHz
98.69 dB μ V/m

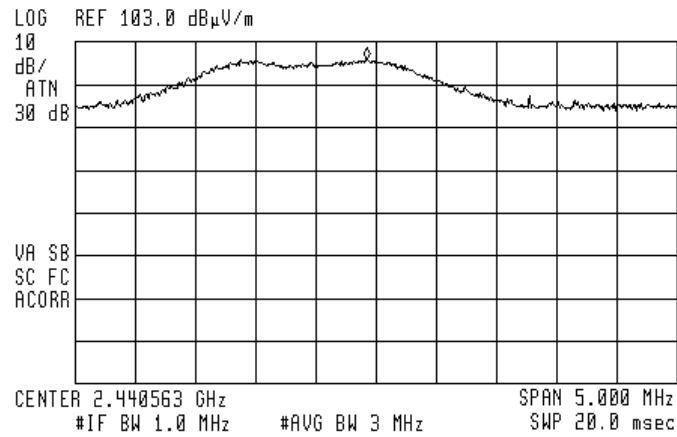


Figure 8 2440 MHz

16:17:14 NOV 05, 2008

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 2.480413 GHz
100.67 dB μ V/m

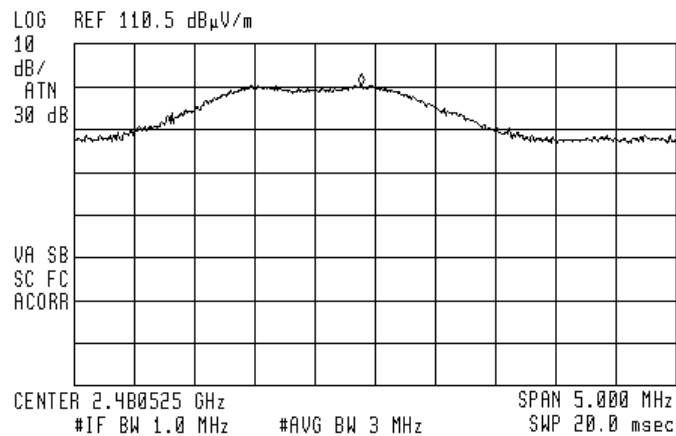


Figure 9 2480 MHz

4.3 Results Table

E.U.T. Description: Wireless RFID Reader

Model No.: SecurNozzle

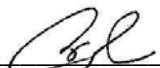
Serial Number: Not Designated

Specification: F.C.C. Part 15, Subpart C

Frequency	E	E	Antenna Gain	Antenna Distance	Calculated Results	Limit	Margin
(MHz)	(dBμV/m)	(V/m)	(dBi)	(m)	(mW)	(W)	(mW)
2405.00	96.92	0.07	0	3	1.47	1.0	-998.53
2440.00	98.69	0.09	0	3	2.43	1.0	-997.57
2480.00	100.67	0.11	0	3	3.63	1.0	-996.37

JUDGEMENT: Passed by 996.37 mW

TEST PERSONNEL:

Tester Signature: 

Date: 25.01.09

Typed/Printed Name: A. Sharabi

4.4 Test Equipment Used.

Radiated Maximum Power Output

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
Receiver	HP	85422E	3906A00276	November 12, 2007	1 year
RF Section	HP	85420E	3705A00248	November 12, 2007	1 year
Antenna Mast	ARA	AAM-4A	1001	N/A	N/A
Turntable	ARA	ART-1001/4	1001	N/A	N/A
Mast & Table Controller	ARA	ACU-2/5	1001	N/A	N/A
Printer	HP	LaserJet 2200	JPKG19982	N/A	N/A
Antenna-Log Periodic	A.H.System	SAS-200/511	253	February 4, 2007	2 years

Figure 10 Test Equipment Used

5. Band Edge

[In Accordance with section 15.247(d)]

5.1 Test procedure

The E.U.T was placed on a non-metallic table, 0.8 meters above the ground plane, on a remote-controlled turntable in the OATS. The test distance was 3 meters.

The transmitter unit operated with normal modulation. The EMI receiver was set to 1 MHz resolution BW. The EUT was set up as shown in Figure 1, and its proper operation was checked.

The EMI receiver was adjusted to the transmission channel at the maximum radiated level. The display line was set to 20 dBc and the EMI receiver was set to the band edge frequencies.

Maximum power level below 2400 MHz and above 2483.5 MHz was measured relative to power level at 2405 MHz, and 2485 MHz correspondingly.

The E.U.T. was tested in 2 operating channels and frequencies (11 (2.405 GHz); 26 (2.480 GHz)).

The E.U.T. was tested at 2410 and 2480 MHz with modulation.

16:06:46 NOV 05, 2008

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 2.400000 GHz
67.93 dB μ V/m

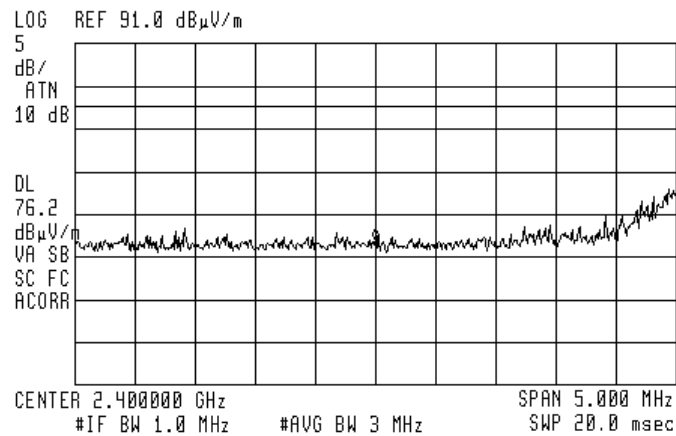


Figure 11 — 2405 MHz

16:28:59 NOV 05, 2008

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 2.483500 GHz
70.66 dB μ V/m

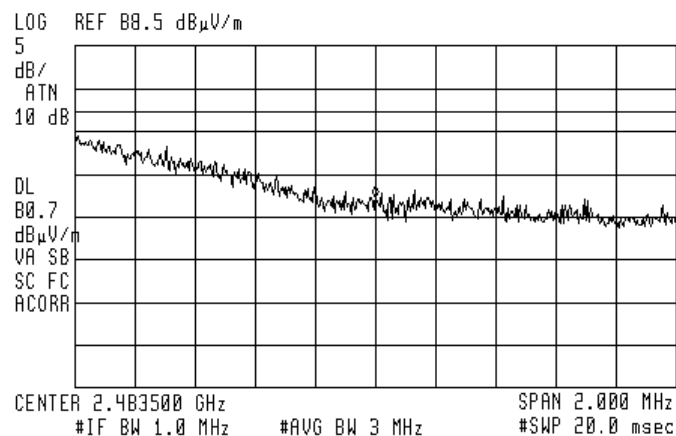


Figure 12 — 2480 MHz

5.2 Results table


E.U.T. Description: Wireless RFID Reader
 Model No.: SecurNozzle
 Serial Number: Not Designated
 Specification: F.C.C. Part 15, Subpart C (15.247 (d))

Operation Frequency (MHz)	Band Edge Frequency (MHz)	Spectrum Level (dBuV/m)	Specification (dBuV/m)	Margin (dB)
2405	2400.00	67.9	76.2	-8.3
2480	2483.50	70.7	80.7	-10.0

Figure 13 Band Edge

JUDGEMENT: Passed by 8.3 dB

TEST PERSONNEL:

Tester Signature: 

Date: 25.01.09

Typed/Printed Name: A. Sharabi

5.3 Test Equipment Used.

Band edge Spectrum

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
Receiver	HP	85422E	3906A00276	November 12, 2007	1 year
RF Section	HP	85420E	3705A00248	November 12, 2007	1 year
Antenna Mast	ARA	AAM-4A	1001	N/A	N/A
Turntable	ARA	ART-1001/4	1001	N/A	N/A
Mast & Table Controller	ARA	ACU-2/5	1001	N/A	N/A
Printer	HP	LaserJet 2200	JPKG19982	N/A	N/A
Antenna-Log Periodic	A.H.System	SAS-200/511	253	February 4, 2007	2 years

Figure 14 Test Equipment Used

6. Radiated Emission, 9 kHz – 30 MHz

6.1 Test Specification

9 kHz-30 MHz, FCC, Part 15, Subpart C, Section 209

6.2 Test Procedure

The E.U.T. operation mode and test set-up are as described in Section 3.

A preliminary measurement to characterize the E.U.T was performed inside the shielded room at a distance of 3 meters, using peak detection mode and broadband antennas. The preliminary measurements produced a list of the highest emissions. The E.U.T was then transferred to the open site, and placed on a remote-controlled turntable. The E.U.T was placed on a non-metallic table, 0.8 meters above the ground. The configuration tested is shown in Figure 3.1.

The frequency range 9 kHz-30 MHz was scanned.

The emissions were measured using a computerized EMI receiver complying to CISPR 16 requirements. The specification limits and applicable correction factors are loaded to the receiver via a 3.5" floppy disk.

In the frequency range 9 kHz-30MHz, the loop antenna was rotated on its vertical axis. The antenna height (center of loop) was 1 meter at a distance of 3 meters.

The E.U.T. was tested in three operating channels and frequencies
(1 (2.405 GHz); 8 (2.440 GHz); 14 (2.480 GHz).

6.3 Measured Data

JUDGEMENT: Passed

The EUT met the requirements of the F.C.C. Part 15, Subpart C, Section 209 specification.

The results for all three channels were the same.

No signals were detected in the frequency range of 9 kHz – 30 MHz.

TEST PERSONNEL:

Tester Signature: 

Date: 25.01.09

Typed/Printed Name: A. Sharabi

6.4 Test Instrumentation Used, Radiated Measurements

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	HP	85422E	3906A00276	November 12, 2007	1 year
RF Section	HP	85420E	3705A00248	November 12, 2007	1 year
Active Loop Antenna	EMCO	6502	9506-2950	October 15, 2008	1 year
Antenna Mast	ARA	AAM-4A	1001	N/A	N/A
Turntable	ARA	ART-1001/4	1001	N/A	N/A
Mast & Table Controller	ARA	ACU-2/5	1001	N/A	N/A
Printer	HP	LaserJet 2200	JPKGC19982	N/A	N/A

6.5 Field Strength Calculation

The field strength is calculated directly by the EMI Receiver software, and a "Correction Factors" data disk, using the following equation:

$$FS = RA + AF + CF$$

FS: Field Strength [dB μ v/m]
 RA: Receiver Amplitude [dB μ v]
 AF: Receiving Antenna Correction Factor [dB/m]
 CF: Cable Attenuation Factor [dB]

No external pre-amplifiers are used.

7. Spurious Radiated Emission 30 – 1000 MHz

7.1 Test Specification

30 MHz-1000 MHz, F.C.C., Part 15, Subpart C

7.2 Test Procedure

The E.U.T. operation mode and test set-up are as described in Section 3.

See Section 3.1 Justification of the System Test Configuration concerning the E.U.T. orientation for this test.

A preliminary measurement to characterize the E.U.T was performed inside the shielded room at a distance of 3 meters, using peak detection mode and broadband antennas. The preliminary measurements produced a list of the highest emissions. The E.U.T was then transferred to the open site, and placed on a remote-controlled turntable. The E.U.T was placed on a non-metallic table, 0.8 meters above the ground..

The frequency range 30 MHz-1000 MHz was scanned, and the list of the highest emissions was verified and updated accordingly.

The levels of the emissions within the frequency ranges of the restricted bands (Section 15.205 of FCC Part 15) were compared to the limits of the table in Section 15.209 (a), General Requirements.

The emissions were measured using a computerized EMI receiver complying to CISPR 16 requirements. The specification limits and applicable correction factors are loaded to the receiver via a 3.5" floppy disk.

In the frequency range 30-1000 MHz, the readings were maximized by adjusting the antenna height between 1-4 meters, the turntable azimuth between 0-360°, and the antenna polarization.

Verification of the E.U.T emissions was based on the following methods:

- Turning the E.U.T on and off.

- Using a frequency span less than 10 MHz.

- Observation of the signal level during turntable rotation. Background noise is not affected by the rotation of the E.U.T.

The E.U.T. was tested in three operating channels and frequencies (1 (2.405GHz); 8 (2.440 GHz); 14 (2.480 GHz).

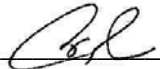
7.3 **Test Data**

JUDGEMENT: Passed

The EUT met the requirements of the F.C.C. Part 15, Subpart C, specification.
The results for all three operation channels were the same.

The signals in the band 30 MHz – 1.0 GHz were below the spectrum analyzer noise level, at least 20 dB below the specification limit.

TEST PERSONNEL:

Tester Signature: 

Date: 25.01.09

Typed/Printed Name: A. Sharabi

7.4 Test Instrumentation Used, Radiated Measurements

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	HP	85422E	3906A00276	November 12, 2007	1 year
RF Section	HP	85420E	3705A00248	November 12, 2007	1 year
Antenna Bioconical	ARA	BCD 235/B	1041	March 23, 2008	1 year
Antenna Log Periodic	ARA	LPD-2010/A	1038	November 22, 2007	1 year
Antenna Mast	ARA	AAM-4A	1001	N/A	N/A
Turntable	ARA	ART-1001/4	1001	N/A	N/A
Mast & Table Controller	ARA	ACU-2/5	1001	N/A	N/A
Printer	HP	LaserJet 2200	JPKGC19982	N/A	N/A

7.5 Field Strength Calculation

The field strength is calculated directly by the EMI Receiver software, and a "Correction Factors" data disk, using the following equation:

$$[\text{dB}\mu\text{V/m}] \text{ FS} = \text{RA} + \text{AF} + \text{CF}$$

FS: Field Strength [dB μ V/m]
 RA: Receiver Amplitude [dB μ V]
 AF: Receiving Antenna Correction Factor [dB/m]
 CF: Cable Attenuation Factor [dB]

No external pre-amplifiers are used.

8. Spurious Radiated Emission Above 1 GHz

8.1 Radiated Emission Above 1 GHz

The E.U.T operation mode and test set-up are as described in Section 3.

See Section 3.1 Justification of the System Test Configuration concerning the E.U.T. orientation for this test.

A preliminary measurement to characterize the E.U.T was performed inside the shielded room, using peak detection mode and broadband antennas. The preliminary measurements produced a list of the highest emissions. The E.U.T was then transferred to the open site, and placed on a remote-controlled turntable. The E.U.T was placed on a non-metallic table, 0.8 meters above the ground. The configuration tested is shown in Figure 3.1.

The levels of the emissions within the frequency ranges of the restricted bands (Section 15.205 of FCC Part 15) were compared to the limits of the table in Section 15.209 (a), General Requirements.

In the frequency range 1-2.9 GHz, a computerized EMI receiver complying to CISPR 16 requirements was used.

In the frequency range 2.9-25.0 GHz, a spectrum analyzer including a low noise amplifier was used. During average measurements, the IF bandwidth was 1 MHz and the video bandwidth was 100Hz. During peak measurements, the IF bandwidth was 1 MHz and the video bandwidth was 3 MHz.

The test distance was 3 meters.

The readings were maximized by adjusting the antenna height between 1-4 meters, the turntable azimuth between 0-360°, and the antenna polarization.

Verification of the E.U.T emissions was based on the following methods: turning the E.U.T on and off; using a frequency span less than 10 MHz; observation of the signal level during turntable rotation. (Background noise is not affected by the rotation of the E.U.T.)

The E.U.T. was tested in three operating channels and frequencies (1 (2.405 GHz); 8 (2.440 GHz); 14 (2.480 GHz)).

8.2 Test Data

JUDGEMENT: Passed by 1.5 dB

For the operation channel 11 (2.405 GHz), the margin between the emission level and the specification limit is 1.7 in the worst case at the frequency of 4810.00 MHz, vertical polarization.


For the operation channel 18 (2.440 GHz), the margin between the emission level and the specification limit is 1.5 in the worst case at the frequency of 4880.00 MHz, vertical polarization.

For the operation channel 26 (2.480 GHz), the margin between the emission level and the specification limit is 3.0 in the worst case at the frequency of 4960.00 MHz, vertical polarization.

The EUT met the requirements of the F.C.C. Part 15, Subpart C, specification.

The details of the highest emissions are given in *Figure 15* to *Figure 16*.

TEST PERSONNEL:

Tester Signature:  Date: 25.03.09
Typed/Printed Name: A. Sharabi

Radiated Emission Above 1 GHz

E.U.T Description Wireless RFID Reader
Type SecurNozzle
Serial Number: Not Designated

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Horizontal/Vertical Frequency range: 1.0 GHz to 25.0 GHz
Test Distance: 3 meters Detector: Peak

Operation Frequency (MHz)	Freq. (MHz)	Polarity (H/V)	Peak Amp (dB μ V/m)	Peak. Specification (dB μ V/m)	Peak. Margin (dB)
2405.00	2390.00	V	52.8*	74.0	-21.2
2405.00	4810.00	H	67.5*	74.0	-6.5
2405.00	4810.00	V	72.3*	74.0	-1.7
2440.00	4880.00	H	58.0*	74.0	-16.0
2440.00	4880.00	V	72.5*	74.0	-1.5
2480.00	2483.50	H	68.0*	74.0	-6.0
2480.00	2483.50	V	70.0*	74.0	-4.0
2480.00	4960.00	H	64.0*	74.0	-10.0
2480.00	4960.00	V	71.0*	74.0	-3.0

**Figure 15. Radiated Emission. Antenna Polarization: HORIZONTAL / VERTICAL.
Detector: Peak**

Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

“Peak Amp” includes correction factor.

* “Correction Factor” = Antenna Factor + Cable Loss- Low Noise Amplifier Gain

Radiated Emission Above 1 GHz

E.U.T Description Wireless RFID Reader
Type SecurNozzle
Serial Number: Not Designated

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Horizontal/Vertical

Frequency range: 1.0 GHz to 25.0 GHz

Test Distance: 3 meters

Detector: Average

Operation Frequency: MHz

Operation Frequency (MHz)	Freq. (MHz)	Polarity (H/V)	Average Amp (dBμ V/m)	Average Specification (dB μ V/m)	Average Margin (dB)
2405.00	2390.00	V	40.2*	54.0	-13.8
2405.00	4810.00	H	43.4*	54.0	-10.6
2405.00	4810.00	V	44.6*	54.0	-9.4
2440.00	4880.00	H	42.3*	54.0	-11.7
2440.00	4880.00	V	44.6*	54.0	-9.4
2480.00	2483.50	H	45.3*	54.0	-8.7
2480.00	2483.50	V	45.3*	54.0	-8.7
2480.00	4960.00	H	42.3*	54.0	-11.7
2480.00	4960.00	V	43.8*	54.0	-10.2

**Figure 16. Radiated Emission. Antenna Polarization: HORIZONTAL / VERTICAL.
Detector: Average**

Notes:

Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

“Average Amp” includes correction factor.

* Correction Factor = Antenna Factor + Cable Loss- Low Noise Amplifier Gain

8.3 Test Instrumentation Used, Radiated Measurements Above 1 GHz

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Period
EMI Receiver	HP	85422E	3906A00276	November 12, 2007	1 Year
RF Filter Section	HP	85420E	3705A00248	November 12, 2007	1 Year
Antenna Biconical	ARA	BCD 235/B	1041	March 23, 2008	1 Year
Antenna Log Periodic	ARA	LPD-2010/A	1038	November 22, 2007	1 Year
Antenna Log Periodic	A.H. Systems	SAS-200/511	253	February 4, 2007	2 Years
Double Ridged Waveguide Horn Antenna	EMCO	3115	29845	March 16, 2008	2 Years
Horn Antenna	ARA	SWH-28	1008	December 8, 2006	2 Years
Horn Antenna	Narda	V637	0410	December 8, 2006	2 Years
Spectrum Analyzer	HP	8592L	3826A01204	March 5, 2008	1 Year
Spectrum Analyzer	HP	8546E	3442A00275	November 14, 2007	1 Year
Antenna Mast	ARA	AAM-4A	1001	N/A	N/A
Turntable	ARA	ART-1001/4	1001	N/A	N/A
Mast & Table Controller	ARA	ACU-2/5	1001	N/A	N/A
Printer	HP	LaserJet 2200	JPKG19982	N/A	N/A

9. Radiated Power Spectral Density

[In accordance with section 15.247(d)]

9.1 Test procedure

The E.U.T was placed on a non-metallic table, 0.8 meters above the ground plane, on a remote-controlled turntable in the OATS. The test distance was 3 meters.

The transmitter unit operated with normal modulation. The EMI receiver was set to 1 MHz resolution BW. The EUT was set up as shown in Figure 3, and its proper operation was checked.

The readings were maximized by adjusting the antenna height between 1-4 meters, the turntable azimuth between 0-360°, and the antenna polarization.

The E.U.T. was tested in three operating channels and frequencies
1 (2.405 GHz); 8 (2.440 GHz); 14 (2.480 GHz).

Then the EMI receiver was set to 3 kHz resolution BW, span of 300.0 kHz, and sweep time of 100 seconds. The spectrum peaks were located at each of the 3 operating frequencies.

Radiated peak output power levels were converted to power level according to the formula as shown below:

$$P = \frac{(E_{V/m} \times d)^2}{(30 \times G)} \text{ [W]}$$

16:00:48 NOV 05, 2008

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 2.4054630 GHz
82.95 dB μ V/m

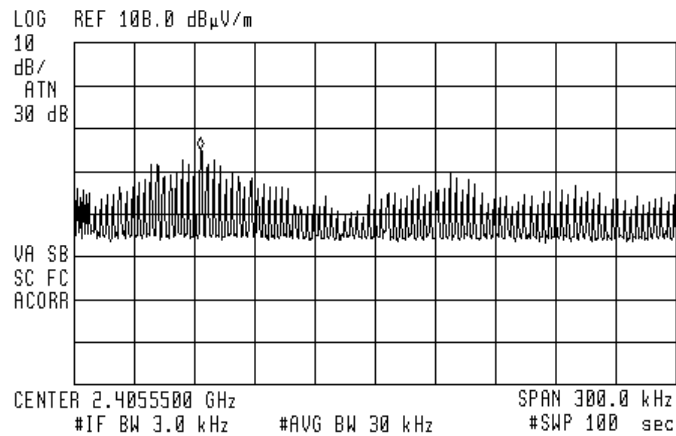


Figure 17 — 2405 MHz

15:45:27 NOV 05, 2008

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 2.4395293 GHz
83.51 dB μ V/m

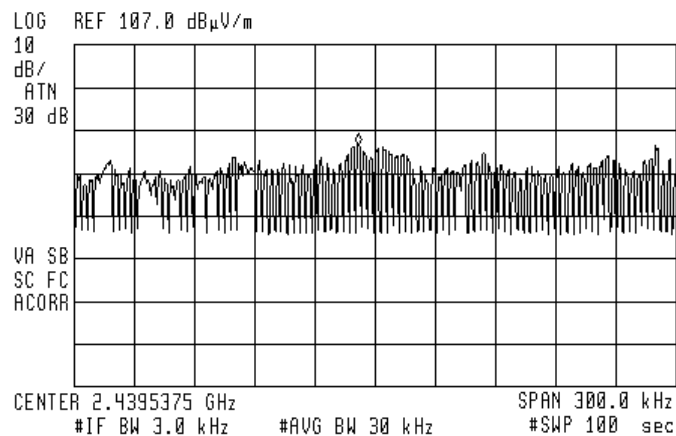


Figure 18 — 2440 MHz

16:24:26 NOV 05, 2008

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 2.4802790 GHz
85.01 dBμV/m

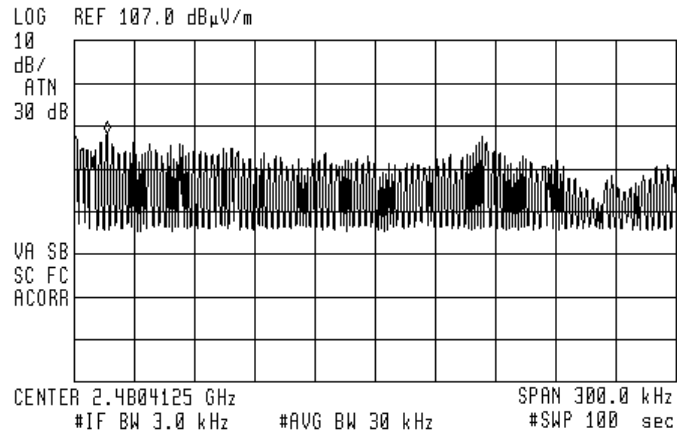


Figure 19 — 2480 MHz

9.2 Results table

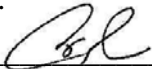
E.U.T. Description: Wireless RFID Reader
Model No.: SecurNozzle
Serial Number: Not Designated
Specification: F.C.C. Part 15, Subpart C (15.247(d))

Frequency	E	Spectral Density Result	Antenna Gain	Antenna Distance	Calculated Results	Spec.	Margi n
(MHz)	(dBμV/m)	(V/m)	(dBi)	(m)	(mW)	(mW)	(mW)
2405.00	82.95	0.01	0	3	0.03	6.3	-6.27
2440.00	83.51	0.01	0	3	0.03	6.3	-6.72
2480.00	85.01	0.02	0	3	0.12	6.3	-6.18

Figure 20 Test Results

JUDGEMENT: Passed 6.2 mW

TEST PERSONNEL:

Tester Signature: 

Date: 25.01.09

Typed/Printed Name: A. Sharabi

9.3 Test Equipment Used.

Transmitted Power Density

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	HP	85422E	3906A00276	November 12, 2007	1 year
RF Section	HP	85420E	3705A00248	November 12, 2007	1 year
Antenna Log Periodic	A.H. Systems	SAS-200/511	253	February 4, 2007	2 years
Antenna Mast	ARA	AAM-4A	1001	N/A	N/A
Turntable	ARA	ART-1001/4	1001	N/A	N/A
Mast & Table Controller	ARA	ACU-2/5	1001	N/A	N/A
Printer	HP	LaserJet 2200	JPKGC19982	N/A	N/A

Figure 21 Test Equipment Used

10. Antenna Gain/Information

The antenna gain is 0 dBi simulated.

11. R.F Exposure/Safety

Typical use of the E.U.T. is enabling the automatic fueling and registering of motorized vehicles. The typical placement of the E.U.T. is on a fuel pump nozzle. The typical distance between the E.U.T. and the user in the worst case application, is 1 cm .

Calculation of Maximum Permissible Exposure (MPE) Based on Section 1.1307(b)(1) Requirements

(a) FCC limit is:

$$1 \frac{mW}{cm^2}$$

Using table 1 of Section 1.1310 limit for general population/uncontrolled exposures, the above level is an average over 30 minutes.

(b) The power density produced by the E.U.T. is

$$S = \frac{P_t G_t}{4\pi R^2}$$

P_t- Transmitted Power 3.63 mw (Peak)

G_T- Antenna Gain, 0 dBi = 0.9 (Numeric)

R- Distance from Transmitter using 1 cm worst case

(c) Transmitter peak power using source based time averaging of 0.2% maximum, 20 msec “ON” time, “OFF” + “ON” time 100 msec:

$$P_t = \frac{3.63 \times 20}{100} = 0.726mW$$

(d) The peak power density (time averaging) is :

$$S_p = \frac{0.726 \times 0.9}{4\pi(1)^2} = 0.051 \times 10^{-3} \frac{mW}{cm^2}$$

(e) This is significantly below the FCC limit.

12. Radiated Emission, 115kHz Transmitter, 9 kHz – 30 MHz

12.1 Test Specification

9 kHz-30 MHz, FCC, Part 15, Subpart C, Section 209

12.2 Test Procedure

The E.U.T. operation mode and test set-up are as described in Section 3.

A preliminary measurement to characterize the E.U.T was performed inside the shielded room at a distance of 3 meters, using peak detection mode and broadband antennas. The preliminary measurements produced a list of the highest emissions. The E.U.T was then transferred to the open site, and placed on a remote-controlled turntable. The E.U.T was placed on a non-metallic table, 0.8 meters above the ground. The configuration tested is shown in Figure 3.1.

The frequency range 9 kHz-30 MHz was scanned.

The emissions were measured using a computerized EMI receiver complying to CISPR 16 requirements. The specification limits and applicable correction factors are loaded to the receiver via a 3.5" floppy disk.

In the frequency range 9 kHz-30MHz, the loop antenna was rotated on its vertical axis. The antenna height (center of loop) was 1 meter at a distance of 3 meters.

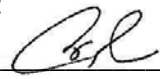
The E.U.T. was operated at the frequency of 115 kHz. This frequency was measured using a peak detector.

12.1 Measured Data

JUDGEMENT: Passed by 12 dB

The EUT was tested and it met the requirements of the FCC Part 15, Subpart C, specification.

TEST PERSONNEL:

Tester Signature: 

Date: 25.01.09

Typed/Printed Name: A. Sharabi

Radiated Emission

E.U.T Description Wireless RFID Reader

Type SecurNozzle

Serial Number: Not Designated

Specification: FCC Part 15, Subpart C

Antenna: 3 meters distance

Frequency range: 9 kHz to 30 MHz

Detectors: Peak

Frequency (MHz)	Peak Amp (dBμV/m)	Average Amp* (dBμV/m)	Correction (dB)	Average Specification (dBμV/m)	Margin (dB)
0.116	94.3	94.3	-11.0	106.3	-12.0
0.333	43.6	43.6	-11.0	97.1	-53.5

Figure 22. Radiated Emission. Detectors: Peak, Quasi-peak

Note: Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

$$F = 0.116 \text{ MHz} \quad \text{Limit}_{300\text{m}} = 20 \log \frac{2400}{116} = 26.3 \text{ dB}\mu\text{V} / \text{m}$$

$$\text{Limit}_{3\text{m}} = 26.3 + 40 \log \frac{300}{3} = 106.3 \text{ dB}\mu\text{V} / \text{m}$$

$$F = 0.333 \text{ MHz} \quad \text{Limit}_{3\text{m}} = 17.1 + 40 \log \frac{300}{3} = 97.1 \text{ dB}\mu\text{V} / \text{m}$$

* Average Factor = 0

Radiated Emission, 9 kHz-30 MHz

10:09:49 NOV 10, 2008

ACTV DET: PEAK
 MEAS DET: PEAK QP AVG
 MKR 116.013 kHz
 94.30 dB μ V/m

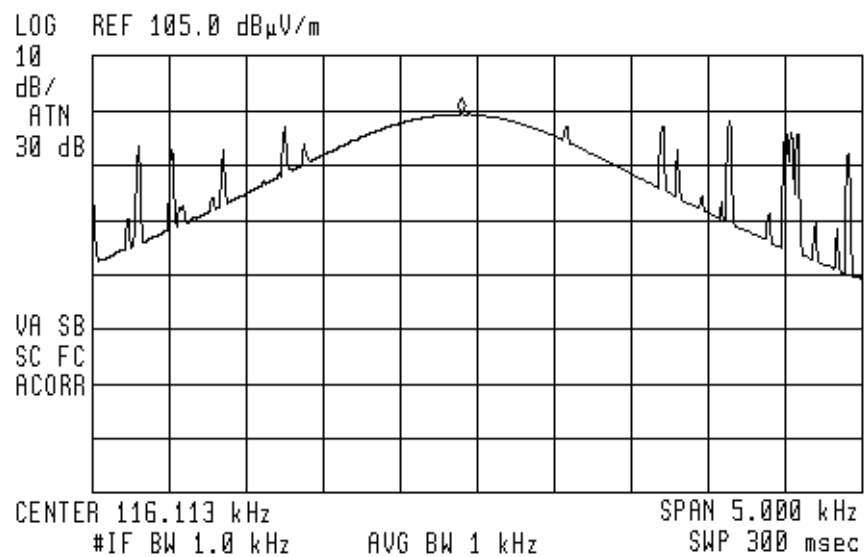


Figure 23 Radiated Emission. Detectors: Peak

12.2 Test Instrumentation Used, Radiated Measurements

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	HP	85422E	3906A00276	November 12, 2007	1 year
RF Section	HP	85420E	3705A00248	November 12, 2007	1 year
Active Loop Antenna	EMCO	6502	9506-2950	October 15, 2008	1 year
Antenna Mast	ARA	AAM-4A	1001	N/A	N/A
Turntable	ARA	ART-1001/4	1001	N/A	N/A
Mast & Table Controller	ARA	ACU-2/5	1001	N/A	N/A
Printer	HP	ThinkJet 2225	2738508357.0	N/A	N/A

12.1 Field Strength Calculation

The field strength is calculated directly by the EMI Receiver software, and a "Correction Factors" data disk, using the following equation:

$$FS = RA + AF + CF$$

FS: Field Strength [dBμv/m]
 RA: Receiver Amplitude [dBμv]
 AF: Receiving Antenna Correction Factor [dB/m]
 CF: Cable Attenuation Factor [dB]

No external pre-amplifiers are used.

13. Radiated Emission, 115 kHz Transmitter, 30 MHz –1 GHz

13.1 Test Specification

30 MHz-1000 MHz, FCC, Part 15, Subpart C

13.2 Test Procedure

The E.U.T. operation mode and test set-up are as described in Section 3.

A preliminary measurement to characterize the E.U.T was performed inside the shielded room at a distance of 3 meters, using peak detection mode and broadband antennas. The preliminary measurements produced a list of the highest emissions. The E.U.T was then transferred to the open site, and placed on a remote-controlled turntable. The E.U.T was placed on a non-metallic table, 0.8 meters above the ground. The configuration tested is shown in Figure 3.1. The frequency range 30 MHz-1000 MHz was scanned, and the list of the highest emissions was verified and updated accordingly.

The levels of the emissions within the frequency ranges of the restricted bands (Section 15.205 of FCC Part 15) were compared to the limits of the table in Section 15.209 (a), General Requirements.

The emissions were measured using a computerized EMI receiver complying to CISPR 16 requirements. The specification limits and applicable correction factors are loaded to the receiver via a 3.5" floppy disk.

In the frequency range 30-1000MHz, the readings were maximized by adjusting the antenna height between 1-4 meters. The turntable azimuth between 0-360°, and the antenna polarization.

Verification of the E.U.T emissions was based on the following methods:

- Turning the E.U.T on and off.

- Using a frequency span less than 10 MHz.

- Observation of the signal level during turntable rotation. Background noise is not affected by the rotation of the E.U.T.

The E.U.T. highest frequency source or used frequency is 24 MHz.

13.3 Measured Data

JUDGEMENT: Passed

The EUT was tested and it met the requirements of the FCC Part 15, Subpart C, specification.

The signals in the band 30 – 1000 MHz were below the spectrum analyzer noise level, at least 20 dB below the specification limit.

TEST PERSONNEL:

Tester Signature: 

Date: 25.01.09

Typed/Printed Name: A. Sharabi

13.4 Test Instrumentation Used, Radiated Measurements

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	HP	85422E	3906A00276	November 12, 2007	1 year
RF Section	HP	85420E	3705A00248	November 12, 2007	1 year
Antenna Bioconical	ARA	BCD 235/B	1041	March 23, 2008	1 year
Antenna Log Periodic	ARA	LPD-2010/A	1038	November 22, 2007	1 year
Antenna Mast	ARA	AAM-4A	1001	N/A	N/A
Turntable	ARA	ART-1001/4	1001	N/A	N/A
Mast & Table Controller	ARA	ACU-2/5	1001	N/A	N/A
Printer	HP	LaserJet 2200	JPKG19982	N/A	N/A

14. APPENDIX B - CORRECTION FACTORS

14.1 Correction factors for CABLE

from EMI receiver
to test antenna
at 3 meter range.

FREQUENCY (MHz)	CORRECTION FACTOR (dB)	FREQUENCY (MHz)	CORRECTION FACTOR (dB)
10.0	0.3	1200.0	7.3
20.0	0.6	1400.0	7.8
30.0	0.8	1600.0	8.4
40.0	0.9	1800.0	9.1
50.0	1.1	2000.0	9.9
60.0	1.2	2300.0	11.2
70.0	1.3	2600.0	12.2
80.0	1.4	2900.0	13.0
90.0	1.6		
100.0	1.7		
150.0	2.0		
200.0	2.3		
250.0	2.7		
300.0	3.1		
350.0	3.4		
400.0	3.7		
450.0	4.0		
500.0	4.3		
600.0	4.7		
700.0	5.3		
800.0	5.9		
900.0	6.3		
1000.0	6.7		

NOTES:

1. The cable type is RG-214.
2. The overall length of the cable is 27 meters.
3. The above data is located in file 27MO3MO.CBL on the disk marked "Radiated Emission Tests EMI Receiver".

14.2 Correction factors for CABLE

from EMI receiver
to test antenna
at 3 meter range.

FREQUENCY (GHz)	CORRECTION FACTOR (dB)
1.0	1.2
2.0	1.6
3.0	2.0
4.0	2.4
5.0	3.0
6.0	3.4
7.0	3.8
8.0	4.2
9.0	4.6
10.0	5.0
12.0	5.8

NOTES:

1. The cable type is RG-8.
2. The overall length of the cable is 10 meters.

14.3 Correction factors for CABLE

from spectrum analyzer
to test antenna above 2.9 GHz

FREQUENCY (GHz)	CORRECTION FACTOR (dB)	FREQUENCY (GHz)	CORRECTION FACTOR (dB)
1.0	1.9	14.0	9.1
2.0	2.7	15.0	9.5
3.0	3.5	16.0	9.9
4.0	4.2	17.0	10.2
5.0	4.9	18.0	10.4
6.0	5.5	19.0	10.7
7.0	6.0	20.0	10.9
8.0	6.5	21.0	11.2
9.0	7.0	22.0	11.6
10.0	7.5	23.0	11.9
11.0	7.9	24.0	12.3
12.0	8.3	25.0	12.6
13.0	8.7	26.0	13.0

NOTES:

1. The cable type is SUCOFLEX 104 E manufactured by SUHNER.
2. The cable is used for measurements above 2.9 GHz.
3. The overall length of the cable is 10 meters.

14.4 Correction factors for CABLE

from EMI receiver
to test antenna
at 10 meter range.

FREQUENCY (MHz)	CORRECTION FACTOR (dB)	FREQUENCY (MHz)	CORRECTION FACTOR (dB)
10.0	0.3	1200.0	9.8
20.0	0.8	1400.0	10.0
30.0	0.9	1600.0	11.3
40.0	1.2	1800.0	12.2
50.0	1.4	2000.0	13.1
60.0	1.6	2300.0	14.5
70.0	1.8	2600.0	15.9
80.0	1.9	2900.0	16.4
90.0	2.0		
100.0	2.1		
150.0	2.6		
200.0	3.2		
250.0	3.8		
300.0	4.2		
350.0	4.6		
400.0	5.1		
450.0	5.3		
500.0	5.6		
600.0	6.3		
700.0	7.0		
800.0	7.6		
900.0	8.0		
1000.0	8.7		

NOTES:

1. The cable type is RG-214.
2. The overall length of the cable is 34 meters.
3. The above data is located in file 34M10MO.CBL on the disk marked "Radiated Emissions Tests EMI Receiver".

12.6 Correction factors for LOG PERIODIC ANTENNA

**Type LPD 2010/A
at 3 and 10 meter ranges.**

Distance of 3 meters

FREQUENCY (MHz)	AFE (dB/m)
200.0	9.1
250.0	10.2
300.0	12.5
400.0	15.4
500.0	16.1
600.0	19.2
700.0	19.4
800.0	19.9
900.0	21.2
1000.0	23.5

Distance of 10 meters

FREQUENCY (MHz)	AFE (dB/m)
200.0	9.0
250.0	10.1
300.0	11.8
400.0	15.3
500.0	15.6
600.0	18.7
700.0	19.1
800.0	20.2
900.0	21.1
1000.0	23.2

NOTES:

1. Antenna serial number is 1038.
2. The above lists are located in file number 38M30.ANT for a 3 meter range,
and file number 38M100.ANT for a 10 meter range.
3. The files mentioned above are located on the disk marked "Radiated Emission
Test EMI Receiver".

14.5 Correction factors for LOG PERIODIC ANTENNA
Type SAS-200/511
at 3 meter range.

FREQUENCY	ANTENNA FACTOR
(GHz)	(dB)
1.0	24.9
1.5	27.8
2.0	29.9
2.5	31.2
3.0	32.8
3.5	33.6
4.0	34.3
4.5	35.2
5.0	36.2
5.5	36.7
6.0	37.2
6.5	38.1

FREQUENCY	ANTENNA FACTOR
(GHz)	(dB)
7.0	38.6
7.5	39.2
8.0	39.9
8.5	40.4
9.0	40.8
9.5	41.1
10.0	41.7
10.5	42.4
11.0	42.5
11.5	43.1
12.0	43.4
12.5	44.4
13.0	44.6

NOTES:

1. Antenna serial number is 253.
2. The above lists are located in file number SAS3M0.ANT for a 3 meter range.
3. The files mentioned above are located on the disk marked "Antenna Factors".

14.6 Correction factors for **BICONICAL ANTENNA**

**Type BCD-235/B,
at 3 meter range**

FREQUENCY (MHz)	AFE (dB/m)
20.0	19.4
30.0	14.8
40.0	11.9
50.0	10.2
60.0	9.1
70.0	8.5
80.0	8.9
90.0	9.6
100.0	10.3
110.0	11.0
120.0	11.5
130.0	11.7
140.0	12.1
150.0	12.6
160.0	12.8
170.0	13.0
180.0	13.5
190.0	14.0
200.0	14.8
210.0	15.3
220.0	15.8
230.0	16.2
240.0	16.6
250.0	17.6
260.0	18.2
270.0	18.4
280.0	18.7
290.0	19.2
300.0	19.9
310	20.7
320	21.9
330	23.4
340	25.1
350	27.0

NOTES:

1. Antenna serial number is 1041.
2. The above list is located in file 19BC10M1.ANT on the disk marked "Radiated Emissions Tests EMI Receiver".

14.7 Correction factors for **BICONICAL ANTENNA**

**Type BCD-235/B,
10 meter range**

FREQUENCY (MHz)	AFE (dB/m)
30.0	12.1
40.0	10.6
50.0	10.6
60.0	8.9
70.0	8.5
80.0	9.6
90.0	9.4
100.0	9.6
110.0	10.3
120.0	10.7
130.0	12.6
140.0	12.7
150.0	12.7
160.0	13.8
170.0	13.7
180.0	14.9
190.0	13.4
200.0	13.1
210.0	14.0
220.0	14.5
230.0	15.8
240.0	16.0
250.0	16.6
260.0	16.7
270.0	18.3
280.0	18.5
290.0	19.3
300.0	20.9

NOTES:

1. Antenna serial number is 1041.
2. The above list is located in file 41BC10M1.ANT on the disk marked "Radiated Emissions Tests EMI Receiver".

14.8 Correction factors for Double-Ridged Waveguide Horn

**Model: 3115, S/N 29845
at 3 meter range.**

FREQUENCY (GHz)	ANTENNA FACTOR (dB 1/m)	ANTENN A Gain (dBi)	FREQUENCY (GHz)	ANTENNA FACTOR (dB 1/m)	ANTENNA Gain (dBi)
1.0	24.8	5.4	10.0	38.8	11.4
1.5	26.1	7.6	10.5	38.9	11.8
2.0	28.6	7.7	11.0	39.0	12.1
2.5	29.8	8.4	11.5	39.6	11.8
3.0	31.4	8.4	12.0	39.8	12.0
3.5	32.4	8.7	12.5	39.6	12.5
4.0	33.7	8.6	13.0	40.0	12.5
4.5	33.4	9.9	13.5	39.8	13.0
5.0	34.5	9.7	14.0	40.2	13.0
5.5	35.1	9.9	14.5	40.6	12.9
6.0	35.4	10.4	15.0	41.3	12.4
6.5	35.6	10.8	15.5	39.5	14.6
7.0	36.2	10.9	16.0	38.8	15.5
7.5	37.3	10.4	16.5	40.0	14.6
8.0	37.7	10.6	17.0	41.4	13.4
8.5	38.3	10.5	17.5	44.8	10.3
9.0	38.5	10.8	18.0	47.2	8.1
9.5	38.7	11.1			

14.9 Correction factors for

Horn Antenna
Model: SWH-28
at 1 meter range.

FREQUENCY (GHz)	APE (dB /m)	Gain (dBi)
18.0	40.3	16.1
19.0	40.3	16.3
20.0	40.3	16.1
21.0	40.3	16.3
22.0	40.4	16.8
23.0	40.5	16.4
24.0	40.5	16.6
25.0	40.5	16.7
26.0	40.6	16.4

14.10 Correction factors for

Horn Antenna Model: V637

FREQUENCY (GHz)	APE (dB /m)	Gain (dB1)
26.0	43.6	14.9
27.0	43.7	15.1
28.0	43.8	15.3
29.0	43.9	15.5
30.0	43.9	15.8
31.0	44.0	16.0
32.0	44.1	16.2
33.0	44.1	16.4
34.0	44.1	16.7
35.0	44.2	16.9
36.0	44.2	17.1
37.0	44.2	17.4
38.0	44.2	17.6
39.0	44.2	17.8
40.0	44.2	18.0

14.11 Correction factors for ACTIVE LOOP ANTENNA

Model 6502

S/N 9506-2950

FREQUENCY	Magnetic Antenna Factor	Electric Antenna Factor
(MHz)	(dB)	(dB)
.009	-35.1	16.4
.010	-35.7	15.8
.020	-38.5	13.0
.050	-39.6	11.9
.075	-39.8	11.8
.100	-40.0	11.6
.150	-40.0	11.5
.250	-40.0	11.6
.500	-40.0	11.5
.750	-40.1	11.5
1.000	-39.9	11.7
2.000	-39.5	12.0
3.000	-39.4	12.1
4.000	-39.7	11.9
5.000	-39.7	11.8
10.000	40.2	11.3
15.000	-40.7	10.8
20.000	-40.5	11.0
25.000	-41.3	10.2
30.000	42.3	9.2